

Flaxleaf fleabane: A problem weed in zero-tillage dryland cropping

By Hanwen Wu and Steve Walker*

Fleabane is now recognised as one of the major difficult-to-control weeds in northern NSW and southern Queensland. For many growers, fallow weed control costs have doubled due to this weed alone. Worse still, no-till farming systems are being threatened by the increasing need for cultivation as a control tactic. Despite this grim outlook, a sensible approach to integrated weed management (IWM) will greatly reduce the impact of fleabane upon crop production.

Knowing the culprit

The fleabane problem is thought to have arisen from recent changes in farming practice. These changes include adoption of no-till farming, a significant reduction in use of group B herbicides in wheat and the introduction of wide-row spacing in sorghum. It is also likely that recent seasonal conditions have favoured the spread of this problem weed.

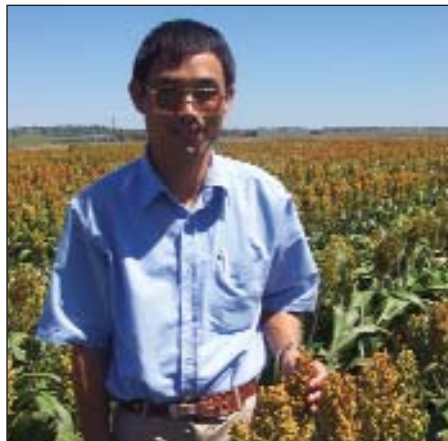
Although there are three fleabane species in Australia (flaxleaf fleabane, Canadian fleabane and tall fleabane), flaxleaf fleabane is the most common in dryland cropping systems. It's easy to see why — a single mature flaxleaf fleabane produces an average of 110,000 seeds!

In addition to being a prolific seed producer, each seed carries its own pappus, or umbrella of light hairs. The pappus enables the seed to be easily lifted and dispersed by wind over great distances. Such seed characteristics make fleabane a major weed problem.

Emergence of fleabane occurs predominantly over spring/summer, continuing into autumn. Although very limited emergence occurs in mid-winter, young autumn or early-winter seedlings actively grow during winter despite cold and dry conditions.

Surprisingly, while there doesn't appear to be much growth above ground, root growth progresses extremely well. Roots grow as deeply as 35 cm into the soil to absorb available water.

The building of such a strong rooting system during winter provides sufficient food reserve for rapid growth during the following spring. These over-wintered fleabane plants are therefore very difficult to control.



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What can be done?

For known infestations of fleabane, tackling the problem in different parts of the cropping system will require a strategic approach based on IWM principles. An IWM approach to fleabane control is similar to that needed for any weed problem, namely:

- Develop a weed management strategy. In doing so, take care to account for risk of development of herbicide resistance, in particular to Group M herbicides.
- Aim to maximise competition against weeds. Crop rotations such as winter cereals and sorghum can be used in competitive planting configurations to maximise competition against fleabane.

- Closely monitor fleabane emergence throughout the cropping system. This will ensure adequate treatment of young seedlings and maximise herbicide effectiveness. Small weeds can be covered with stubble.

- Aim to prevent seed-set. Carefully select suitable herbicides (Amitrol T for fleabane) and ensure that application is suitably timed.

IWM takes planning and vigilance. Paddocks infested with fleabane will therefore need a weed plan prior to spraying and planting. A good plan considers the best cropping and planting options and the role of residual herbicides, tank mixes and pre-harvest sprays.

Control of small seedlings in fallows

Herbicide performance depends largely on weed size and growing conditions at spraying. In the past few years, over 180 herbicide treatments have been tested on fleabane in fallows in the northern grain region, but most of them did not achieve consistent effective control. Interestingly, herbicide actions on fleabane plants proved to be extremely slow, with visual herbicide effects appearing as late as one month after treatment application.

Correct timing of herbicide application

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It is important to target small weeds with herbicides.

is essential for a good IWM program. It is crucial to apply herbicides when the plant is small, prior to stem elongation. Control efficacy will decline as plants mature.

Unfortunately, putting this simple theory into practice can be a little more complicated. Significant rain events can stimulate emergence flushes and result in the simultaneous presence of fleabane at various growth stages. In such instances, plant maturity may range from very small seedlings to large mature plants, thereby making the timely application of herbicides difficult — another good reason why implementation of a fleabane management program should not be delayed.

Recent research by the Queensland DPI&F showed that glyphosate alone is normally ineffective, except on very small weeds. As plants matured, control was reduced from 88 per cent mortality for weeds five centimetres in diameter to 13 per cent mortality for weeds 10 cm in diameter or larger.

But a number of unregistered glyphosate mixes provided better control of young plants at the rosette stage. Suitable mixing partners to glyphosate include 2,4-D ester, Grazon DS, Tordon 75D, Ally, and Surpass. Atrazine also provided residual control of several flushes.

Split applications of glyphosate followed by SpraySeed or paraquat were also very effective. These follow-up treatments need to be applied at higher water volumes. When choosing the tank mixture with glyphosate, plant-back periods and crop rotation need to be taken into consideration.

Preventing seed set

Prevention of seed set of weed survivors is an integral part of weed management. Our research has shown that Amitrole T could be strategically used as a late treatment to target mature survivors.

Although it did not completely kill the plant, its damaging effects on elongated shoots and flowering heads could substantially reduce the replenishment of new seeds into the soil. Late application of glyphosate to flowering plants also seems to be effective in sterilising seeds.

In-crop options

Good in-crop control of fleabane is believed to greatly reduce the problem in the following fallow. As fleabane is thought to be susceptible to sulfonylurea and triazine residual herbicides, a sulfonylurea herbicide could be applied in-crop for wheat. This may be followed or mixed with Tordon 242, or 2,4-D amine. Late flushes



Mature weeds are more difficult to control.

in spring could be treated with a pre-harvest spraying of 2,4-D amine after the wheat dough stage.

Due to emergence patterns, fleabane is likely to be a problem in spring-sown sorghum grown in wide rows. Effective management options need to be properly planned and implemented.

Prior to sorghum, winter fallow flushes should be treated with glyphosate + Surpass, which could be followed by SpraySeed or paraquat to control survivors. Early spring flushes could be treated with atrazine + 2,4-D or atrazine + SpraySeed prior to planting sorghum, or atrazine + glyphosate at planting.

Later flushes in-crop should be treated with atrazine + Starane or atrazine + 2,4-D with a shielded sprayer or a boom with droppers. The atrazine is likely to provide some residual control of seedlings.

If chickpea is grown, fallow treatment with Flame and in-crop treatment with Balance + Simazine are thought to be reasonable options.

If dryland cotton is grown, treatment combinations of diuron, fluometuron and prometryn followed by inter-row cultivation or chipping are possible control options.

Non-chemical control options

Fleabane flourishes in bare fallow, cropping gaps, or in poorly competitive crops. Growing more competitive winter cereals and avoiding the use of skip rows in sorghum should therefore be seen as an important part of sustainable weed management packages.

Winter cereal should be sown at optimum seeding rates in rows less than 35 cm. Conversely, less competitive crops

such as chickpea, dryland cotton and sunflower should be avoided in paddocks heavily infested with fleabane.

There is potential for the strategic use of tillage to control mature and stressed weeds. This would be useful in fallows and for inter-row cultivation in wide-row crops such as sorghum and cotton. Cultivation is not likely to reduce subsequent fleabane emergence, unless the tillage operation inverts the soil to bury seed below two centimetres.

Herbicide resistance

Alarmingly, overseas reports have shown that biotypes of fleabane species have evolved resistance to a range of herbicides across different groups, particularly to glyphosate. The wide spread of glyphosate resistance in Canadian fleabane in the US, and the first report of flaxleaf fleabane resistant to glyphosate in South Africa in 2003, have raised great concern in our cotton and grain industries.

Although herbicide resistant biotypes of flaxleaf fleabane have not yet been documented in Australia, a preliminary study indicated that a population has developed resistance to glyphosate in the Goondiwindi region. This is a somewhat controversial issue, as some believe that the weed has become more difficult to control with glyphosate over time, whereas others consider that fleabane has always been difficult to control with glyphosate alone.

There is a need to clarify whether or not the flaxleaf fleabane is naturally tolerant to glyphosate, and if there are any differences in herbicide tolerance between populations. The presence of any resistance to

glyphosate also needs to be confirmed. These are study areas to be addressed in a PhD project funded by the Australian Weeds CRC.

Current research

In response to the fleabane problem, the Queensland DPI&F hosted a national workshop on fleabane in February 2004. The workshop brought together industry experts to compile and examine all available research on the weed.

In doing so, the workshop team identified which areas of scientific knowledge of fleabane were lacking. This enabled the team to prioritise future research efforts and resulted in a draft management strategy. Proceedings from the workshop are available from the website of the CRC for Australian Weed Management (www.weeds.crc.org.au).

The DPI&F continues with its fleabane research. Current studies are examining effective control options using both post-emergent and residual herbicides in winter fallow, wheat and sorghum. These experiments aim to optimise fleabane management in rotational crops and fallows with dryland cotton, thereby reducing fleabane infestations in cotton crops.

In addition, studies are investigating seed



Ongoing research is looking at fleabane control using post-emergent and residual herbicides in sorghum and cereal crops.

persistence, germination requirement, and emergence patterns. The next phase of research will focus on control options in summer fallow prior to cropping with dryland cotton.

Conclusion

The success of fleabane is attributed to prolific seeding, its ability to emerge throughout the year, and its relative tolerance to herbicides due to its hairy characteristics. It is important to closely monitor flushes to ensure timely application and to maximise herbicide performance.

The best long-term management strategy for fleabane control is to treat weeds

early and to reduce soil seedbank by effective control of weed survivors. Crop rotations and planting configurations should be managed to maximise competition against fleabane. An IWM program would need to be implemented in order to prevent or retard fleabane resistance to herbicides.

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The authors would like to thank Therese McGillion of Australian Weed CRC for her critical comments on this article.

